

This key should allow you to understand why you choose the option you did (beyond just getting a question right or wrong). More instructions on how to use this key can be found [here](#).

If you have a suggestion to make the keys better, please fill out the short survey [here](#).

Note: This key is auto-generated and may contain issues and/or errors. The keys are reviewed after each exam to ensure grading is done accurately. If there are issues (like duplicate options), they are noted in the offline gradebook. The keys are a work-in-progress to give students as many resources to improve as possible.

1. Choose the **smallest** set of Real numbers that the number below belongs to.

$$\sqrt{\frac{13225}{25}}$$

The solution is Whole, which is option E.

A. Irrational

These cannot be written as a fraction of Integers.

B. Not a Real number

These are Nonreal Complex numbers **OR** things that are not numbers (e.g., dividing by 0).

C. Integer

These are the negative and positive counting numbers (... , -3, -2, -1, 0, 1, 2, 3, ...)

D. Rational

These are numbers that can be written as fraction of Integers (e.g., -2/3)

E. Whole

* This is the correct option!

General Comment: First, you **NEED** to simplify the expression. This question simplifies to 115.

Be sure you look at the simplified fraction and not just the decimal expansion. Numbers such as 13, 17, and 19 provide **long but repeating/terminating decimal expansions!**

The only ways to *not* be a Real number are: dividing by 0 or taking the square root of a negative number.

Irrational numbers are more than just square root of 3: adding or subtracting values from square root of 3 is also irrational.

2. Simplify the expression below into the form $a + bi$. Then, choose the intervals that a and b belong to.

$$(7 - 5i)(3 - 4i)$$

The solution is $1 - 43i$, which is option B.

A. $a \in [1, 5]$ and $b \in [41, 51]$

$1 + 43i$, which corresponds to adding a minus sign in both terms.

B. $a \in [1, 5]$ and $b \in [-43, -38]$

* $1 - 43i$, which is the correct option.

C. $a \in [40, 44]$ and $b \in [12, 17]$

$41 + 13i$, which corresponds to adding a minus sign in the second term.

D. $a \in [40, 44]$ and $b \in [-15, -7]$

$41 - 13i$, which corresponds to adding a minus sign in the first term.

E. $a \in [21, 24]$ and $b \in [20, 23]$

$21 + 20i$, which corresponds to just multiplying the real terms to get the real part of the solution and the coefficients in the complex terms to get the complex part.

General Comment: You can treat i as a variable and distribute. Just remember that $i^2 = -1$, so you can continue to reduce after you distribute.

3. Simplify the expression below and choose the interval the simplification is contained within.

$$12 - 16^2 + 7 \div 6 * 5 \div 2$$

The solution is -241.083 , which is option D.

A. $[270, 274.4]$

270.917 , which corresponds to an Order of Operations error: multiplying by negative before squaring. For example: $(-3)^2 \neq -3^2$

B. $[267.4, 269.4]$

268.117 , which corresponds to two Order of Operations errors.

C. $[-245.1, -241.9]$

-243.883 , which corresponds to an Order of Operations error: not reading left-to-right for multiplication/division.

D. $[-242.5, -240.2]$

* -241.083 , this is the correct option

E. None of the above

You may have gotten this by making an unanticipated error. If you got a value that is not any of the others, please let the coordinator know so they can help you figure out what happened.

General Comment: While you may remember (or were taught) PEMDAS is done in order, it is actually done as P/E/MD/AS. When we are at MD or AS, we read left to right.

4. Choose the **smallest** set of Complex numbers that the number below belongs to.

$$\sqrt{\frac{225}{196}} + 4i^2$$

The solution is Rational, which is option C.

A. Nonreal Complex

This is a Complex number ($a + bi$) that is not Real (has i as part of the number).

B. Not a Complex Number

This is not a number. The only non-Complex number we know is dividing by 0 as this is not a number!

C. Rational

* This is the correct option!

D. Pure Imaginary

This is a Complex number $(a + bi)$ that **only** has an imaginary part like $2i$.

E. Irrational

These cannot be written as a fraction of Integers. Remember: π is not an Integer!

General Comment: Be sure to simplify $i^2 = -1$. This may remove the imaginary portion for your number. If you are having trouble, you may want to look at the *Subgroups of the Real Numbers* section.

5. Simplify the expression below into the form $a + bi$. Then, choose the intervals that a and b belong to.

$$(-5 - 2i)(3 + 4i)$$

The solution is $-7 - 26i$, which is option E.

A. $a \in [-18, -11]$ and $b \in [-11, -5]$

$-15 - 8i$, which corresponds to just multiplying the real terms to get the real part of the solution and the coefficients in the complex terms to get the complex part.

B. $a \in [-32, -21]$ and $b \in [13, 19]$

$-23 + 14i$, which corresponds to adding a minus sign in the second term.

C. $a \in [-9, -5]$ and $b \in [24, 31]$

$-7 + 26i$, which corresponds to adding a minus sign in both terms.

D. $a \in [-32, -21]$ and $b \in [-20, -11]$

$-23 - 14i$, which corresponds to adding a minus sign in the first term.

E. $a \in [-9, -5]$ and $b \in [-29, -19]$

* $-7 - 26i$, which is the correct option.

General Comment: You can treat i as a variable and distribute. Just remember that $i^2 = -1$, so you can continue to reduce after you distribute.

6. Simplify the expression below and choose the interval the simplification is contained within.

$$4 - 6 \div 9 * 5 - (20 * 3)$$

The solution is -59.333 , which is option C.

A. $[-58.3, -57.8]$

-58.000 , which corresponds to not distributing a negative correctly.

B. $[-56.4, -53.1]$

-56.133 , which corresponds to an Order of Operations error: not reading left-to-right for multiplication/division.

C. $[-61.6, -58.2]$

* -59.333 , which is the correct option.

D. $[61.6, 64.1]$

63.867, which corresponds to not distributing addition and subtraction correctly.

E. None of the above

You may have gotten this by making an unanticipated error. If you got a value that is not any of the others, please let the coordinator know so they can help you figure out what happened.

General Comment: While you may remember (or were taught) PEMDAS is done in order, it is actually done as P/E/MD/AS. When we are at MD or AS, we read left to right.

7. Simplify the expression below into the form $a + bi$. Then, choose the intervals that a and b belong to.

$$\frac{54 + 44i}{-2 - 3i}$$

The solution is $-18.46 + 5.69i$, which is option C.

A. $a \in [-27.5, -25.5]$ and $b \in [-15, -13.5]$

$-27.00 - 14.67i$, which corresponds to just dividing the first term by the first term and the second by the second.

B. $a \in [0.5, 3]$ and $b \in [-19.5, -18.5]$

$1.85 - 19.23i$, which corresponds to forgetting to multiply the conjugate by the numerator and not computing the conjugate correctly.

C. $a \in [-20.5, -17.5]$ and $b \in [4.5, 7.5]$

$-18.46 + 5.69i$, which is the correct option.

D. $a \in [-240.5, -239]$ and $b \in [4.5, 7.5]$

$-240.00 + 5.69i$, which corresponds to forgetting to multiply the conjugate by the numerator and using a plus instead of a minus in the denominator.

E. $a \in [-20.5, -17.5]$ and $b \in [72.5, 74.5]$

$-18.46 + 74.00i$, which corresponds to forgetting to multiply the conjugate by the numerator.

General Comment: Multiply the numerator and denominator by the *conjugate* of the denominator, then simplify. For example, if we have $2 + 3i$, the conjugate is $2 - 3i$.

8. Choose the **smallest** set of Complex numbers that the number below belongs to.

$$\sqrt{\frac{400}{49}} + \sqrt{156}i$$

The solution is Nonreal Complex, which is option D.

A. Not a Complex Number

This is not a number. The only non-Complex number we know is dividing by 0 as this is not a number!

B. Rational

These are numbers that can be written as fraction of Integers (e.g., $-2/3 + 5$)

C. Pure Imaginary

This is a Complex number ($a + bi$) that **only** has an imaginary part like $2i$.

D. Nonreal Complex

* This is the correct option!

E. Irrational

These cannot be written as a fraction of Integers. Remember: π is not an Integer!

General Comment: Be sure to simplify $i^2 = -1$. This may remove the imaginary portion for your number. If you are having trouble, you may want to look at the *Subgroups of the Real Numbers* section.

9. Simplify the expression below into the form $a + bi$. Then, choose the intervals that a and b belong to.

$$\frac{-36 + 77i}{-1 + 8i}$$

The solution is $10.03 + 3.25i$, which is option E.

A. $a \in [650.5, 653]$ and $b \in [2, 5]$

$652.00 + 3.25i$, which corresponds to forgetting to multiply the conjugate by the numerator and using a plus instead of a minus in the denominator.

B. $a \in [9.5, 12]$ and $b \in [210, 211.5]$

$10.03 + 211.00i$, which corresponds to forgetting to multiply the conjugate by the numerator.

C. $a \in [-10, -7.5]$ and $b \in [-7, -5.5]$

$-8.92 - 5.62i$, which corresponds to forgetting to multiply the conjugate by the numerator and not computing the conjugate correctly.

D. $a \in [34.5, 37.5]$ and $b \in [9, 10]$

$36.00 + 9.62i$, which corresponds to just dividing the first term by the first term and the second by the second.

E. $a \in [9.5, 12]$ and $b \in [2, 5]$

* $10.03 + 3.25i$, which is the correct option.

General Comment: Multiply the numerator and denominator by the *conjugate* of the denominator, then simplify. For example, if we have $2 + 3i$, the conjugate is $2 - 3i$.

10. Choose the **smallest** set of Real numbers that the number below belongs to.

$$-\sqrt{\frac{10}{0}}$$

The solution is Not a Real number, which is option B.

A. Rational

These are numbers that can be written as fraction of Integers (e.g., $-2/3$)

B. Not a Real number

* This is the correct option!

C. Irrational

These cannot be written as a fraction of Integers.

D. Integer

These are the negative and positive counting numbers (... , -3, -2, -1, 0, 1, 2, 3, ...)

E. Whole

These are the counting numbers with 0 (0, 1, 2, 3, ...)

General Comment: First, you **NEED** to simplify the expression. This question simplifies to $-\sqrt{\frac{10}{0}}$.

Be sure you look at the simplified fraction and not just the decimal expansion. Numbers such as 13, 17, and 19 provide **long but repeating/terminating decimal expansions!**

The only ways to *not* be a Real number are: dividing by 0 or taking the square root of a negative number.

Irrational numbers are more than just square root of 3: adding or subtracting values from square root of 3 is also irrational.

11. Choose the **smallest** set of Real numbers that the number below belongs to.

$$\sqrt{\frac{193600}{484}}$$

The solution is Whole, which is option A.

A. Whole

* This is the correct option!

B. Integer

These are the negative and positive counting numbers (... , -3, -2, -1, 0, 1, 2, 3, ...)

C. Not a Real number

These are Nonreal Complex numbers **OR** things that are not numbers (e.g., dividing by 0).

D. Irrational

These cannot be written as a fraction of Integers.

E. Rational

These are numbers that can be written as fraction of Integers (e.g., -2/3)

General Comment: First, you **NEED** to simplify the expression. This question simplifies to 440.

Be sure you look at the simplified fraction and not just the decimal expansion. Numbers such as 13, 17, and 19 provide **long but repeating/terminating decimal expansions!**

The only ways to *not* be a Real number are: dividing by 0 or taking the square root of a negative number.

Irrational numbers are more than just square root of 3: adding or subtracting values from square root of 3 is also irrational.

12. Simplify the expression below into the form $a + bi$. Then, choose the intervals that a and b belong to.

$$(-4 + 5i)(-3 - 10i)$$

The solution is $62 + 25i$, which is option D.

A. $a \in [-42, -35]$ and $b \in [55, 58]$

$-38 + 55i$, which corresponds to adding a minus sign in the first term.

B. $a \in [-42, -35]$ and $b \in [-57, -53]$

$-38 - 55i$, which corresponds to adding a minus sign in the second term.

C. $a \in [12, 14]$ and $b \in [-52, -47]$

$12 - 50i$, which corresponds to just multiplying the real terms to get the real part of the solution and the coefficients in the complex terms to get the complex part.

D. $a \in [58, 63]$ and $b \in [24, 30]$

$* 62 + 25i$, which is the correct option.

E. $a \in [58, 63]$ and $b \in [-31, -19]$

$62 - 25i$, which corresponds to adding a minus sign in both terms.

General Comment: You can treat i as a variable and distribute. Just remember that $i^2 = -1$, so you can continue to reduce after you distribute.

13. Simplify the expression below and choose the interval the simplification is contained within.

$$6 - 1^2 + 3 \div 20 * 5 \div 10$$

The solution is 5.075, which is option D.

A. $[7, 7.04]$

7.003, which corresponds to two Order of Operations errors.

B. $[7.07, 7.09]$

7.075, which corresponds to an Order of Operations error: multiplying by negative before squaring.
For example: $(-3)^2 \neq -3^2$

C. $[4.97, 5.02]$

5.003, which corresponds to an Order of Operations error: not reading left-to-right for multiplication/division.

D. $[5.07, 5.09]$

$* 5.075$, this is the correct option

E. None of the above

You may have gotten this by making an unanticipated error. If you got a value that is not any of the others, please let the coordinator know so they can help you figure out what happened.

General Comment: While you may remember (or were taught) PEMDAS is done in order, it is actually done as P/E/MD/AS. When we are at MD or AS, we read left to right.

14. Choose the **smallest** set of Complex numbers that the number below belongs to.

$$\sqrt{\frac{-780}{6}}i + \sqrt{143}i$$

The solution is Nonreal Complex, which is option E.

A. Pure Imaginary

This is a Complex number $(a + bi)$ that **only** has an imaginary part like $2i$.

B. Not a Complex Number

This is not a number. The only non-Complex number we know is dividing by 0 as this is not a number!

C. Irrational

These cannot be written as a fraction of Integers. Remember: π is not an Integer!

D. Rational

These are numbers that can be written as fraction of Integers (e.g., $-2/3 + 5$)

E. Nonreal Complex

* This is the correct option!

General Comment: Be sure to simplify $i^2 = -1$. This may remove the imaginary portion for your number. If you are having trouble, you may want to look at the *Subgroups of the Real Numbers* section.

15. Simplify the expression below into the form $a + bi$. Then, choose the intervals that a and b belong to.

$$(-4 + 9i)(6 - 3i)$$

The solution is $3 + 66i$, which is option A.

A. $a \in [-2, 4]$ and $b \in [65, 68]$

* $3 + 66i$, which is the correct option.

B. $a \in [-26, -23]$ and $b \in [-33, -25]$

$-24 - 27i$, which corresponds to just multiplying the real terms to get the real part of the solution and the coefficients in the complex terms to get the complex part.

C. $a \in [-52, -50]$ and $b \in [-43, -41]$

$-51 - 42i$, which corresponds to adding a minus sign in the first term.

D. $a \in [-2, 4]$ and $b \in [-71, -61]$

$3 - 66i$, which corresponds to adding a minus sign in both terms.

E. $a \in [-52, -50]$ and $b \in [42, 49]$

$-51 + 42i$, which corresponds to adding a minus sign in the second term.

General Comment: You can treat i as a variable and distribute. Just remember that $i^2 = -1$, so you can continue to reduce after you distribute.

16. Simplify the expression below and choose the interval the simplification is contained within.

$$16 - 8 \div 6 * 9 - (18 * 20)$$

The solution is -356.000 , which is option C.

A. $[-344.15, -341.15]$

-344.148 , which corresponds to an Order of Operations error: not reading left-to-right for multiplication/division.

B. $[370.85, 377.85]$

375.852, which corresponds to not distributing addition and subtraction correctly.

C. $[-357, -353]$

* -356.000, which is the correct option.

D. $[-288, -276]$

-280.000, which corresponds to not distributing a negative correctly.

E. None of the above

You may have gotten this by making an unanticipated error. If you got a value that is not any of the others, please let the coordinator know so they can help you figure out what happened.

General Comment: While you may remember (or were taught) PEMDAS is done in order, it is actually done as P/E/MD/AS. When we are at MD or AS, we read left to right.

17. Simplify the expression below into the form $a + bi$. Then, choose the intervals that a and b belong to.

$$\frac{9 - 77i}{6 - 4i}$$

The solution is $6.96 - 8.19i$, which is option B.

A. $a \in [-6.5, -4.5]$ and $b \in [-10, -9]$

$-4.88 - 9.58i$, which corresponds to forgetting to multiply the conjugate by the numerator and not computing the conjugate correctly.

B. $a \in [6.5, 7.5]$ and $b \in [-8.5, -7]$

* $6.96 - 8.19i$, which is the correct option.

C. $a \in [6.5, 7.5]$ and $b \in [-426.5, -425]$

$6.96 - 426.00i$, which corresponds to forgetting to multiply the conjugate by the numerator.

D. $a \in [0, 2.5]$ and $b \in [18, 20]$

$1.50 + 19.25i$, which corresponds to just dividing the first term by the first term and the second by the second.

E. $a \in [361.5, 363]$ and $b \in [-8.5, -7]$

$362.00 - 8.19i$, which corresponds to forgetting to multiply the conjugate by the numerator and using a plus instead of a minus in the denominator.

General Comment: Multiply the numerator and denominator by the *conjugate* of the denominator, then simplify. For example, if we have $2 + 3i$, the conjugate is $2 - 3i$.

18. Choose the **smallest** set of Complex numbers that the number below belongs to.

$$\sqrt{\frac{-990}{9}}i + \sqrt{165}i$$

The solution is Nonreal Complex, which is option D.

A. Pure Imaginary

This is a Complex number ($a + bi$) that **only** has an imaginary part like $2i$.

B. Irrational

These cannot be written as a fraction of Integers. Remember: π is not an Integer!

C. Not a Complex Number

This is not a number. The only non-Complex number we know is dividing by 0 as this is not a number!

D. Nonreal Complex

* This is the correct option!

E. Rational

These are numbers that can be written as fraction of Integers (e.g., $-2/3 + 5$)

General Comment: Be sure to simplify $i^2 = -1$. This may remove the imaginary portion for your number. If you are having trouble, you may want to look at the *Subgroups of the Real Numbers* section.

19. Simplify the expression below into the form $a + bi$. Then, choose the intervals that a and b belong to.

$$\frac{54 + 55i}{-1 + 8i}$$

The solution is $5.94 - 7.49i$, which is option A.

A. $a \in [5, 6.5]$ and $b \in [-8.5, -7]$

* $5.94 - 7.49i$, which is the correct option.

B. $a \in [-54.5, -53]$ and $b \in [6, 7.5]$

$-54.00 + 6.88i$, which corresponds to just dividing the first term by the first term and the second by the second.

C. $a \in [-8.5, -7]$ and $b \in [5, 6.5]$

$-7.60 + 5.80i$, which corresponds to forgetting to multiply the conjugate by the numerator and not computing the conjugate correctly.

D. $a \in [385, 386.5]$ and $b \in [-8.5, -7]$

$386.00 - 7.49i$, which corresponds to forgetting to multiply the conjugate by the numerator and using a plus instead of a minus in the denominator.

E. $a \in [5, 6.5]$ and $b \in [-487.5, -486]$

$5.94 - 487.00i$, which corresponds to forgetting to multiply the conjugate by the numerator.

General Comment: Multiply the numerator and denominator by the *conjugate* of the denominator, then simplify. For example, if we have $2 + 3i$, the conjugate is $2 - 3i$.

20. Choose the **smallest** set of Real numbers that the number below belongs to.

$$-\sqrt{\frac{42849}{529}}$$

The solution is Integer, which is option D.

A. Whole

These are the counting numbers with 0 (0, 1, 2, 3, ...)

B. Rational

These are numbers that can be written as fraction of Integers (e.g., $-2/3$)

C. Irrational

These cannot be written as a fraction of Integers.

D. Integer

* This is the correct option!

E. Not a Real number

These are Nonreal Complex numbers **OR** things that are not numbers (e.g., dividing by 0).

General Comment: First, you **NEED** to simplify the expression. This question simplifies to -207 .

Be sure you look at the simplified fraction and not just the decimal expansion. Numbers such as 13, 17, and 19 provide **long but repeating/terminating decimal expansions!**

The only ways to *not* be a Real number are: dividing by 0 or taking the square root of a negative number.

Irrational numbers are more than just square root of 3: adding or subtracting values from square root of 3 is also irrational.

21. Choose the **smallest** set of Real numbers that the number below belongs to.

$$\sqrt{\frac{52900}{100}}$$

The solution is Whole, which is option A.

A. Whole

* This is the correct option!

B. Integer

These are the negative and positive counting numbers (... , -3, -2, -1, 0, 1, 2, 3, ...)

C. Rational

These are numbers that can be written as fraction of Integers (e.g., $-2/3$)

D. Irrational

These cannot be written as a fraction of Integers.

E. Not a Real number

These are Nonreal Complex numbers **OR** things that are not numbers (e.g., dividing by 0).

General Comment: First, you **NEED** to simplify the expression. This question simplifies to 230.

Be sure you look at the simplified fraction and not just the decimal expansion. Numbers such as 13, 17, and 19 provide **long but repeating/terminating decimal expansions!**

The only ways to *not* be a Real number are: dividing by 0 or taking the square root of a negative number.

Irrational numbers are more than just square root of 3: adding or subtracting values from square root of 3 is also irrational.

22. Simplify the expression below into the form $a + bi$. Then, choose the intervals that a and b belong to.

$$(-4 - 5i)(7 + 9i)$$

The solution is $17 - 71i$, which is option A.

A. $a \in [17, 26]$ and $b \in [-74, -65]$

* $17 - 71i$, which is the correct option.

B. $a \in [-31, -20]$ and $b \in [-48, -42]$

$-28 - 45i$, which corresponds to just multiplying the real terms to get the real part of the solution and the coefficients in the complex terms to get the complex part.

C. $a \in [-77, -70]$ and $b \in [0, 2]$

$-73 + i$, which corresponds to adding a minus sign in the second term.

D. $a \in [-77, -70]$ and $b \in [-5, 0]$

$-73 - i$, which corresponds to adding a minus sign in the first term.

E. $a \in [17, 26]$ and $b \in [71, 78]$

$17 + 71i$, which corresponds to adding a minus sign in both terms.

General Comment: You can treat i as a variable and distribute. Just remember that $i^2 = -1$, so you can continue to reduce after you distribute.

23. Simplify the expression below and choose the interval the simplification is contained within.

$$13 - 1 \div 4 * 2 - (7 * 20)$$

The solution is -127.500 , which is option C.

A. $[109.29, 110.17]$

110.000 , which corresponds to not distributing a negative correctly.

B. $[-127.31, -126.91]$

-127.125 , which corresponds to an Order of Operations error: not reading left-to-right for multiplication/division.

C. $[-127.51, -127.25]$

* -127.500 , which is the correct option.

D. $[152.53, 153.05]$

152.875 , which corresponds to not distributing addition and subtraction correctly.

E. None of the above

You may have gotten this by making an unanticipated error. If you got a value that is not any of the others, please let the coordinator know so they can help you figure out what happened.

General Comment: While you may remember (or were taught) PEMDAS is done in order, it is actually done as P/E/MD/AS. When we are at MD or AS, we read left to right.

24. Choose the **smallest** set of Complex numbers that the number below belongs to.

$$\frac{2}{8} + \sqrt{-4}i$$

The solution is Rational, which is option A.

A. Rational

* This is the correct option!

B. Not a Complex Number

This is not a number. The only non-Complex number we know is dividing by 0 as this is not a number!

C. Pure Imaginary

This is a Complex number $(a + bi)$ that **only** has an imaginary part like $2i$.

D. Nonreal Complex

This is a Complex number $(a + bi)$ that is not Real (has i as part of the number).

E. Irrational

These cannot be written as a fraction of Integers. Remember: π is not an Integer!

General Comment: Be sure to simplify $i^2 = -1$. This may remove the imaginary portion for your number. If you are having trouble, you may want to look at the *Subgroups of the Real Numbers* section.

25. Simplify the expression below into the form $a + bi$. Then, choose the intervals that a and b belong to.

$$(-10 - 6i)(5 - 8i)$$

The solution is $-98 + 50i$, which is option D.

A. $a \in [-3, 0]$ and $b \in [108.8, 113]$

$-2 + 110i$, which corresponds to adding a minus sign in the first term.

B. $a \in [-99, -97]$ and $b \in [-52.5, -49.9]$

$-98 - 50i$, which corresponds to adding a minus sign in both terms.

C. $a \in [-3, 0]$ and $b \in [-112.2, -107.1]$

$-2 - 110i$, which corresponds to adding a minus sign in the second term.

D. $a \in [-99, -97]$ and $b \in [48.4, 50.8]$

* $-98 + 50i$, which is the correct option.

E. $a \in [-52, -43]$ and $b \in [46.2, 48.4]$

$-50 + 48i$, which corresponds to just multiplying the real terms to get the real part of the solution and the coefficients in the complex terms to get the complex part.

General Comment: You can treat i as a variable and distribute. Just remember that $i^2 = -1$, so you can continue to reduce after you distribute.

26. Simplify the expression below and choose the interval the simplification is contained within.

$$5 - 18^2 + 14 \div 1 * 19 \div 4$$

The solution is -252.500 , which is option C.

A. $[327.18, 332.18]$

329.184, which corresponds to two Order of Operations errors.

B. $[-325.82, -316.82]$

-318.816, which corresponds to an Order of Operations error: not reading left-to-right for multiplication/division.

C. $[-255.5, -250.5]$

* -252.500, this is the correct option

D. $[395.5, 401.5]$

395.500, which corresponds to an Order of Operations error: multiplying by negative before squaring. For example: $(-3)^2 \neq -3^2$

E. None of the above

You may have gotten this by making an unanticipated error. If you got a value that is not any of the others, please let the coordinator know so they can help you figure out what happened.

General Comment: While you may remember (or were taught) PEMDAS is done in order, it is actually done as P/E/MD/AS. When we are at MD or AS, we read left to right.

27. Simplify the expression below into the form $a + bi$. Then, choose the intervals that a and b belong to.

$$\frac{-36 - 88i}{2 - 6i}$$

The solution is $11.40 - 9.80i$, which is option B.

A. $a \in [-15.5, -14]$ and $b \in [0, 1.5]$

$-15.00 + i$, which corresponds to forgetting to multiply the conjugate by the numerator and not computing the conjugate correctly.

B. $a \in [9.5, 11.5]$ and $b \in [-10.5, -9]$

* $11.40 - 9.80i$, which is the correct option.

C. $a \in [-19, -17]$ and $b \in [13.5, 15]$

$-18.00 + 14.67i$, which corresponds to just dividing the first term by the first term and the second by the second.

D. $a \in [9.5, 11.5]$ and $b \in [-393, -391]$

$11.40 - 392.00i$, which corresponds to forgetting to multiply the conjugate by the numerator.

E. $a \in [455, 456.5]$ and $b \in [-10.5, -9]$

$456.00 - 9.80i$, which corresponds to forgetting to multiply the conjugate by the numerator and using a plus instead of a minus in the denominator.

General Comment: Multiply the numerator and denominator by the *conjugate* of the denominator, then simplify. For example, if we have $2 + 3i$, the conjugate is $2 - 3i$.

28. Choose the **smallest** set of Complex numbers that the number below belongs to.

$$\frac{\sqrt{110}}{14} + 5i^2$$

The solution is Irrational, which is option D.

A. Pure Imaginary

This is a Complex number ($a + bi$) that **only** has an imaginary part like $2i$.

B. Not a Complex Number

This is not a number. The only non-Complex number we know is dividing by 0 as this is not a number!

C. Nonreal Complex

This is a Complex number ($a + bi$) that is not Real (has i as part of the number).

D. Irrational

* This is the correct option!

E. Rational

These are numbers that can be written as fraction of Integers (e.g., $-2/3 + 5$)

General Comment: Be sure to simplify $i^2 = -1$. This may remove the imaginary portion for your number. If you are having trouble, you may want to look at the *Subgroups of the Real Numbers* section.

29. Simplify the expression below into the form $a + bi$. Then, choose the intervals that a and b belong to.

$$\frac{36 - 55i}{-1 - 8i}$$

The solution is $6.22 + 5.28i$, which is option E.

A. $a \in [-37, -35]$ and $b \in [6, 8]$

$-36.00 + 6.88i$, which corresponds to just dividing the first term by the first term and the second by the second.

B. $a \in [6, 7]$ and $b \in [342.5, 343.5]$

$6.22 + 343.00i$, which corresponds to forgetting to multiply the conjugate by the numerator.

C. $a \in [-8, -6]$ and $b \in [-4.5, -2]$

$-7.32 - 3.58i$, which corresponds to forgetting to multiply the conjugate by the numerator and not computing the conjugate correctly.

D. $a \in [403.5, 404.5]$ and $b \in [4.5, 6]$

$404.00 + 5.28i$, which corresponds to forgetting to multiply the conjugate by the numerator and using a plus instead of a minus in the denominator.

E. $a \in [6, 7]$ and $b \in [4.5, 6]$

* $6.22 + 5.28i$, which is the correct option.

General Comment: Multiply the numerator and denominator by the *conjugate* of the denominator, then simplify. For example, if we have $2 + 3i$, the conjugate is $2 - 3i$.

30. Choose the **smallest** set of Real numbers that the number below belongs to.

$$\sqrt{\frac{1540}{10}}$$

The solution is Irrational, which is option B.

A. Integer

These are the negative and positive counting numbers (... , -3, -2, -1, 0, 1, 2, 3, ...)

B. Irrational

* This is the correct option!

C. Whole

These are the counting numbers with 0 (0, 1, 2, 3, ...)

D. Rational

These are numbers that can be written as fraction of Integers (e.g., -2/3)

E. Not a Real number

These are Nonreal Complex numbers **OR** things that are not numbers (e.g., dividing by 0).

General Comment: First, you **NEED** to simplify the expression. This question simplifies to $\sqrt{154}$.

Be sure you look at the simplified fraction and not just the decimal expansion. Numbers such as 13, 17, and 19 provide **long but repeating/terminating decimal expansions!**

The only ways to *not* be a Real number are: dividing by 0 or taking the square root of a negative number.

Irrational numbers are more than just square root of 3: adding or subtracting values from square root of 3 is also irrational.
